

Discussion

Reply to ‘Comments of Kerr et al. on “Coastal mangrove forests mitigated tsunami”’ [Estuar. Coast. Shelf Sci. 65 (2005) 601–606]

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We are happy to note that our paper entitled “Coastal mangrove forests mitigated tsunami” published in *Estuarine Coastal and Shelf Science* 65, 601–606, has kindled the interests of scientists (Alexander M. Kerr, Andrew H. Baird and Stuart J. Campbell; Kerr et al., 2006) to accept the paper as potentially important finding. We also appreciate their efforts in analyzing our data with more statistical analysis that leads to a conclusion that two physiographic factors: (1) distance from sea and (2) elevation, alone account for differences between hamlets in human mortality or in loss of wealth in the wake of the Boxing Day Tsunami of 2004. Very similar conclusion has been made in our paper about the importance of location characteristics of human inhabitation to mitigate the fury of tsunami, suggesting that the human inhabitation should be encouraged more than 1 km from the shoreline in elevated places (see abstract — line 4, 5; Observations — para 2 lines 4–6, para 4; Discussion para 5).

The scientists have not arrived at different interpretation of our conclusions and they do not wish to argue that vegetation cannot mitigate damage from tsunamis, against our finding. Their conclusion on the basis of re-analysis of our data is that expecting the coastal vegetation to provide protection from large tsunami appears, overly optimistic and unrealistic. In this regard, we wish to provide explanation. Our study was not made with large tsunami, but small one of 2.8 m run-up height at the study area. Moreover, our sampling is limited to only 18 hamlets of a particular area; extending the sampling sites would have given better picture in favor of vegetation to mitigate damage from tsunami. Our conclusions are very

similar to a recent publication about the ‘Asian Tsunami: a protective role for coastal vegetation’ that appeared in *Science* (Danielsen et al., 2005). This work was in fact, undertaken in the nearby area of our study and it also recorded that the areas with coastal tree vegetation (mangroves and *Casuarina* plantations) were markedly less damaged than areas without, based on satellite images. Further, there are several evidences in favour of coastal vegetation to mitigate tsunami effects. The tree vegetation reduces wave amplitude and energy, as proved by measurements of wave forces and modeling of fluid dynamics (Massel et al., 1999). Analytical model shows that 30 trees from 100 m² in a 100-m-wide belt may reduce the maximum tsunami flow pressure by more than 90% (Hiraishi and Harada, 2003).

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